

# **Introduction To Matlab**

## What Is MATLAB?

- The name MATLAB stands for **matrix laboratory**.
- MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

# Uses of MATLAB

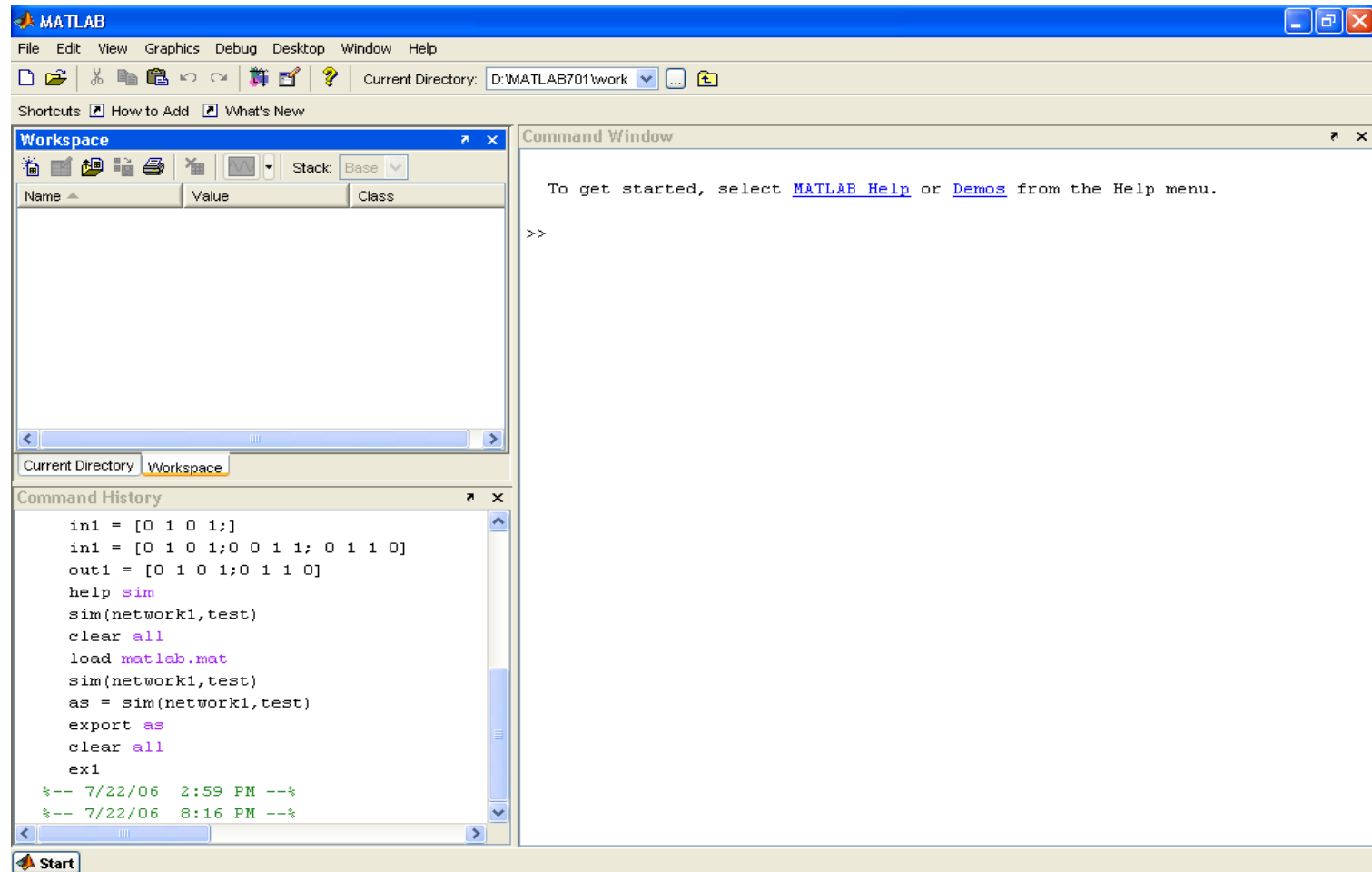
- Math and computation
- Algorithm development
- Data analysis and visualization
- Scientific and engineering graphics

# **The MATLAB Language.**

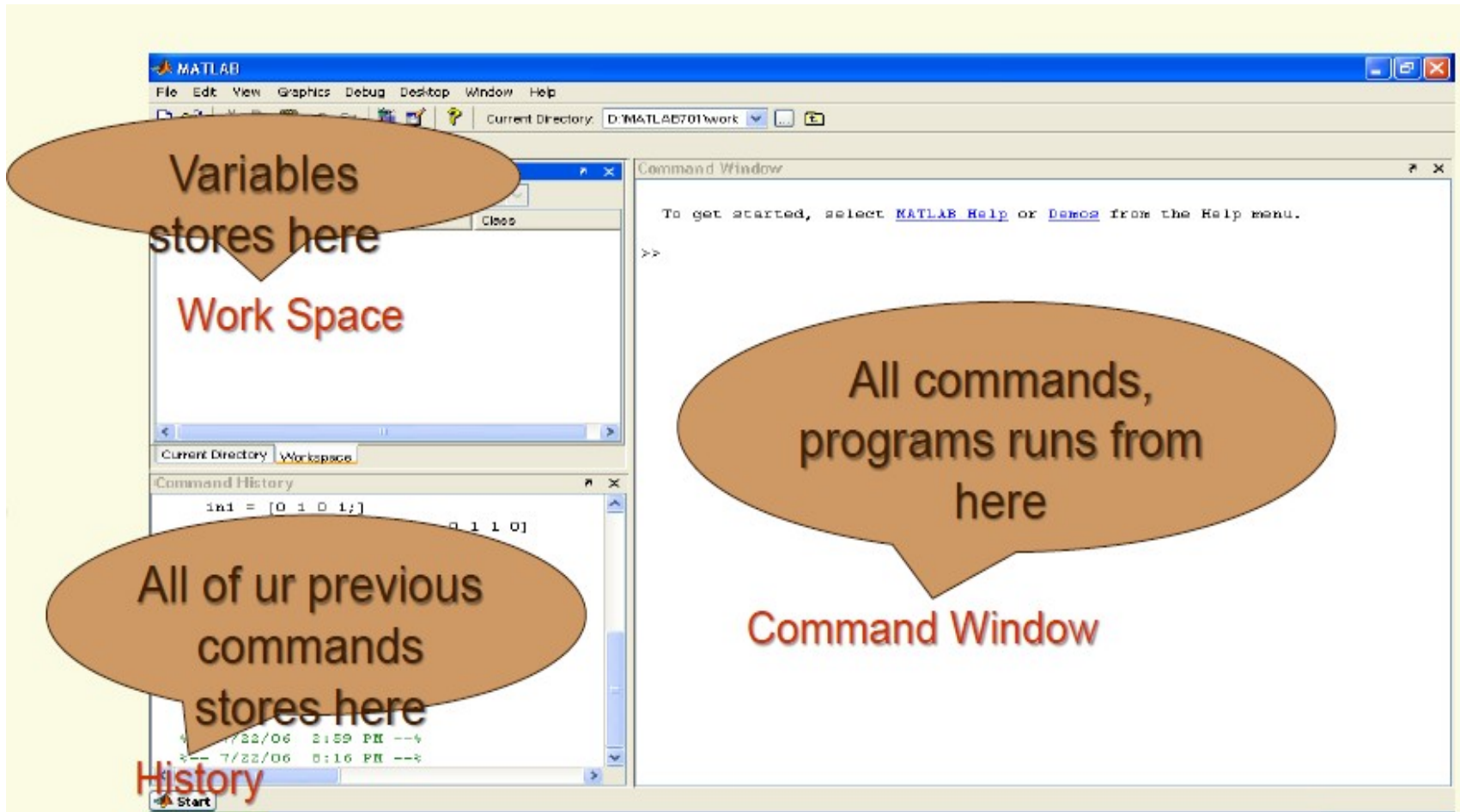
- This is a high-level matrix language with control flow statements, functions, data structures, input/output, and object-oriented programming features.

# Development Environment

- Run the Matlab



# Development Environment



# Vectors

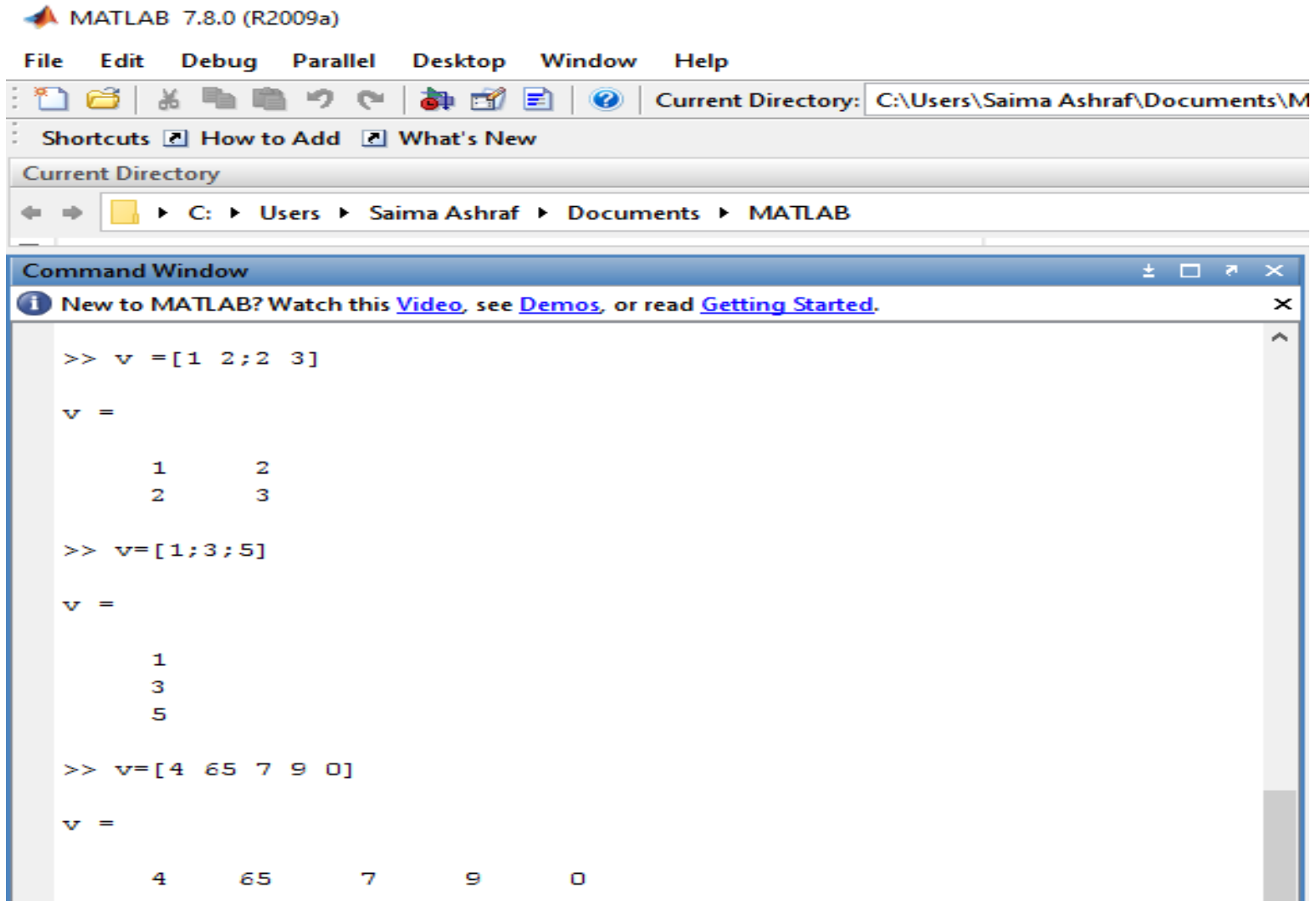
$$\mathbf{A}=[2 \ 3 \ 4 \ 5]$$

These come in two favors and we shall first describe row vectors: they are lists of numbers

separated by either commas or spaces. The number of entries is known as the "length" of the vector and the entries are often referred to as "elements" or "components" of the vector.

The entries must be enclosed in square brackets.

# Vectors(I 10X10,10 ROW,10COL)



The image shows the MATLAB 7.8.0 (R2009a) interface. The top menu bar includes File, Edit, Debug, Parallel, Desktop, Window, and Help. The toolbar contains icons for file operations and help. The Current Directory is set to C:\Users\Saima Ashraf\Documents\MATLAB. The Command Window displays the following code and output:

```
>> v = [1 2; 2 3]

v =

     1     2
     2     3

>> v = [1; 3; 5]

v =

     1
     3
     5

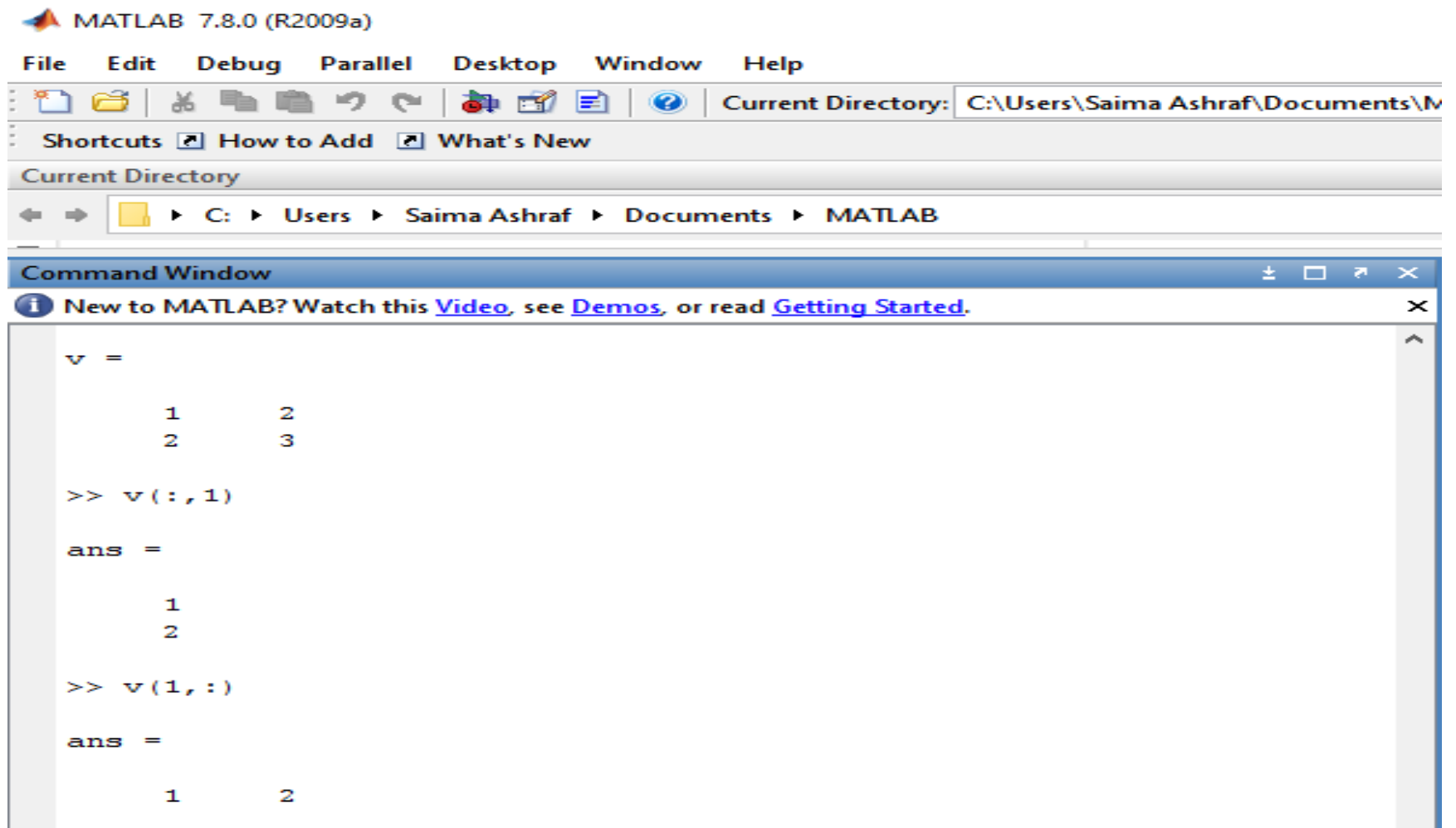
>> v = [4 65 7 9 0]

v =

     4    65     7     9     0
```



Vectors(10X10) :=null V(ROW,COL)



The image shows the MATLAB 7.8.0 (R2009a) interface. The top menu bar includes File, Edit, Debug, Parallel, Desktop, Window, and Help. Below the menu is a toolbar with icons for file operations and a 'Current Directory' field showing 'C:\Users\Saima Ashraf\Documents\MATLAB'. The 'Current Directory' pane shows the path 'C:\Users\Saima Ashraf\Documents\MATLAB'. The 'Command Window' is open, displaying the following code and output:

```
v =  
    1    2  
    2    3  
  
>> v(:,1)  
  
ans =  
    1  
    2  
  
>> v(1,:)   
  
ans =  
    1    2
```

# Vectors (I)

- ```
>> v = [ 1 3, sqrt(5)]
v =
      1.0000      3.0000      2.2361
>> length(v)
ans =
      3
```

Spaces can be vitally important:

```
>> v2 = [3+ 4 5]
v2 =
      7      5
>> v3 = [3 +4 5]
v3 =
      3      4      5
```

# **System And File Commands(I)**

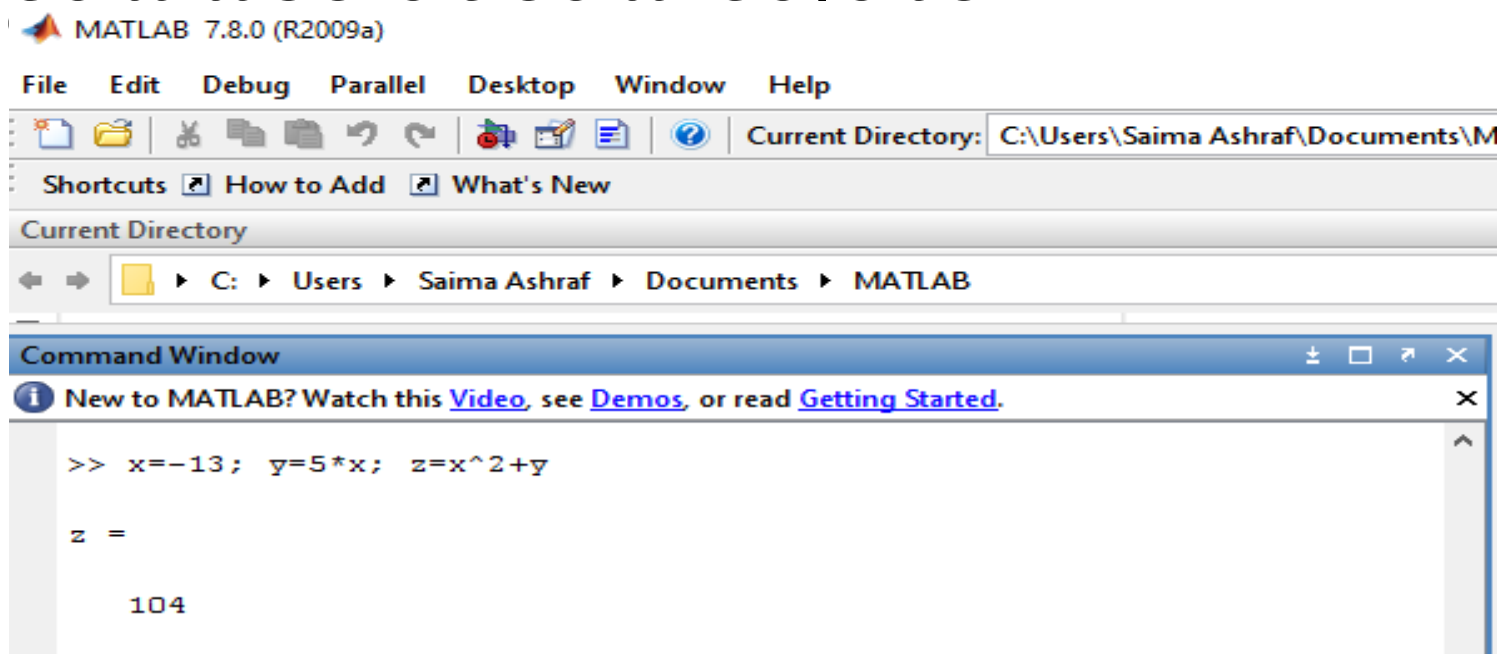
- Clc: Clear the command window
- Clear : Remove variable from memory
- Doc: Display documentation
- Quit or exit: Stops MATLAB
- Who: List current variable
- Whos: List current variables(long display)

# Variables

- MATLAB variable names must begin with a letter, which may be followed by any combination of letters, digits, and underscores. MATLAB distinguishes between uppercase and lowercase characters, so A and a are not the same variable(case sensitive).
- When naming a variable, make sure you are not using a name that is already used as a function name,begin with character .

# Equation Example(I)

- Note also we can place several statements on one line, separated by



A screenshot of the MATLAB 7.8.0 (R2009a) Command Window. The window title is "MATLAB 7.8.0 (R2009a)". The menu bar includes File, Edit, Debug, Parallel, Desktop, Window, and Help. The toolbar shows icons for file operations and help. The "Current Directory" is set to "C:\Users\Saima Ashraf\Documents\MATLAB". The Command Window displays the following code and output:

```
>> x=-13; y=5*x; z=x^2+y  
  
z =  
  
    104
```

# Example(I)

- `>> 2 + 3/4*5`  
`ans =5.7500`
- `>> 3-2^4`  
`ans =-13`
- `>> ans*5`  
`ans = -65`
- Is this calculation  $2 + 3/(4*5)$  or  $2 + (3/4)*5$ ? Matlab works according to the priorities.

# Exercise Question(I)

- Exercise: In each case find the value of the expression in Matlab and explain precisely the order in which the

i)  $-2^3+9$

ii)  $2/3*3$

iii)  $3*2/3$

iv)  $3*4-5^2*2-3$

v)  $(2/3^2*5)*(3-4^3)^2$

vi)  $3*(3*4-2*5^2-3)$

# Special Values

| Function       | description                                                                                                                                                                                              |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Ans</u>     | Most recent answer (variable). If you do not assign an output variable to an expression, MATLAB automatically stores the result in ans.                                                                  |
| <u>pi</u>      | 3.1415926535897...                                                                                                                                                                                       |
| <u>inf</u>     | Infinity. Calculations like $n/0$ , where $n$ is any nonzero real value, result in inf.                                                                                                                  |
| <u>I,J</u>     | The imaginary unit $\sqrt{-1}$                                                                                                                                                                           |
| <u>NaN,nan</u> | Not-a-Number, an invalid numeric value. Expressions like $0/0$ and $\text{inf}/\text{inf}$ result in a NaN, as do arithmetic operations involving a NaN. $n/0$ , where $n$ is complex, also returns NaN. |



# Built-In Functions(I)

- Run on MATLAB

```
>> x = 9;  
>> sqrt(x), exp(x), log(sqrt(x)), log10(x^2+6)  
ans =  
      3  
ans =  
 8.1031e+03  
ans =  
  1.0986  
ans =  
  1.9395
```